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Initial	Date
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MAY 06 1994.

Memorandum

To: ARD, Refuges and Wildlife (60130)
Attention: Maury Wright

From: Regional Engineer, Region 6

Subject: 1993-1994 Annual Water Use Report/Management Plan

The subject report for Lake Andes National Wildlife Refuge has been reviewed and approved.

Please extend our thanks to Refuge personnel for the timely submission of this report.

/S/ WILLIAM A. GODBY

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**1994 ANNUAL WATER MANAGEMENT PLAN
AND
1993 WATER CONDITIONS AND USAGE**

**LAKE ANDES NATIONAL WILDLIFE REFUGE COMPLEX
LAKE ANDES, SD**

WATER UNIT: Lake Andes

I. Introduction

Lake Andes is a 4730 acre meandered lake whose water level depends entirely upon annual runoff. Two dikes cut the lake into three units, the North, Center, and South. Stop log water control structures are located within each dike; however, the lack of a permanent water supply precludes any water level manipulations.

Drainage area size and surface acres for each unit of Lake Andes are shown below. Maximum and average depth figures were determined in 1962.

Unit	Drainage Area Acres		Surface Acres of Water	Water Capacity (Acre Feet)	Depth/full	
					Max	Avg
South	20,000	24%	1,760	16,159	13.5	11.5
Center	11,000	14%	2,359	18,000	14.5	12.9
North	53,000	62%	611	3,015	10.5	9.1
TOTAL	84,000	100%	4,730	37,174	--	--

In 1922, Congress passed a bill establishing a high water elevation of 1437.25 feet msl for Lake Andes via the construction of an artificial outlet on the South Unit. This level was established following local complaints about flooding around the lake. The Fish and Wildlife Service received the right to flood the meandered lake bed of Lake Andes in an easement taken in 1939 from the State of South Dakota.

II. 1993 Water Conditions

Total precipitation for 1993 was 30.74 inches, 9.37 inches above normal. The winter was relatively mild and open with sporadic moderate snowfalls. Snowmelt runoff contributed to the partial filling of the north unit. Soon after snowmelt runoff occurred, heavy rains prevailed allowing the north unit to reach capacity and spill into the center unit. Water elevations increased in all units during the summer due to heavy rains and saturated soil conditions resulting in excessive runoff.

<u>1993 Lake Andes Water Levels - Feet MSL</u>			
<u>Date</u>	<u>North Unit</u>	<u>Center Unit</u>	<u>South Unit</u>
04/02	1435.9	1429.8	1432.1
05/03	1436.5	1431.3	1432.5
06/02	1436.6	1432.0	1433.0
07/01	1437.2	1432.8	1433.5
08/04	1436.8	1434.7	1433.7
09/14	1436.6	1435.2	1433.7
10/01	1436.5	1435.2	1433.7
11/02	1436.6	1435.1	1433.6
12/01	FREEZE-UP		

III. Ecological Effects

Lake Andes is currently in the lake marsh stage where only a few emergents remain around the outside. Since 1987 water levels have been falling. At that time all emergent stands of vegetation were drowned out. Lake Andes will probably remain in the lake marsh stage until a drought begins the cycle again.

Waterfowl breeding pairs totaled 384, up from 283 in 1992. Prior to the spring runoff of 1993, the lake was in its least productive state due to low water elevations and an excess of roughfish, primarily carp and bullheads. Emergent vegetation was nearly non-existent and water turbidity levels were extremely high. This type of condition was not appealing to waterfowl and many other marsh birds. During the winter, the center and north units froze solid and the south unit had an average water depth of approximately 2 feet under the ice layer. A total winter kill occurred in the north and center units with only a partial kill in the south unit. With no carp in the two upper units, water quality increased with the rising water levels in the spring. However, this condition is only short term as carp will soon re-infest the entire lake and water quality will again decrease.

Colonial nesting birds did not nest on Lake Andes in 1993. Prior to this, large numbers of black-crowned night herons, snowy egrets, cattle egrets, and great blue herons nested in flooded Russian olive trees in Johnson's Bay. By mid-summer, water levels approached pre-drought levels but no birds attempted to nest.

The sport fishery in Lake Andes has been on the decline. Nearly 100% of the fish biomass is estimated to be carp and bullheads. A few larger pike exist but their numbers are insignificant in relation to the roughfish in terms of a fishery. A late summer fish sampling of the south unit with frame nets indicated the severity of the roughfish invasion. Six nets were set and all nearly full of carp. Three spawns were identified for the year 1993.

IV. 1993 Water Management Objectives

Management objectives for 1994 are to contain as much runoff as possible in Lake Andes. Water in excess of the 1437.25 elevation mandated by Congress will continue to be released from the outlet on the South Unit.

WATER UNIT: Owens Bay

I. Introduction

The Owens Bay Unit is a 240 acre marsh unit separated by a dike from the South Unit of Lake Andes. A stop-log water control structure is located in the dike to allow water releases into Lake Andes.

Owens Bay, in addition to water from natural runoff, is maintained by a free flowing artesian well. The well, drilled in 1957, originally had a 1000 gpm flow and water right. Well shutdowns during the 1973 DVE outbreak resulted in casing destruction and new casing had to be installed. The new casing reduced the well opening from 12" to 8" and dropped the flow to approximately 450 gpm.

In 1986, Ducks Unlimited funded the drilling of a new 12" artesian well and the old well was capped. The new well has a 800-1000 gpm flow. The well distribution box and pipeline supplying the Prairie Ponds were also replaced. In 1987 the four water control structures on the prairie ponds were retrofitted with new screw gates for better water control.

II. Objectives

Owens Bay water management objectives are to store annual runoff and artesian well water to be used primarily as waterfowl habitat. Waterfowl production is the primary objective on Owens Bay. The emphasis is on providing excellent breeding pair habitat and permanent brood water. Secondary objectives include providing waterfowl migrational habitat and benefits for marsh and water birds, shorebirds, gulls, terns, and resident wildlife.

III. 1993 Water Conditions

The water elevation in Owen's Bay rose to a pool capacity of 1442.8 feet msl and remained at capacity during the entire summer.

The total precipitation for 1993 was 30.74 inches, 9.37 inches above normal. Low to moderate runoff due to snowmelt was recorded. More importantly, heavy rains allowed the bay to fill to capacity. Although the artesian well has a 800-1000 gpm flow, it cannot completely offset water losses to evaporation and percolation under normal precipitation conditions. In addition to these water losses, we are losing a considerable amount of water to the South Unit via piping and seeping through existing dikes.

1993 Water Levels - Owens Bay

<u>Date</u>	<u>Water Level</u>
04/02	1441.5
05/03	1441.8
06/02	1442.3
07/01	1442.1
08/04	1442.8
09/14	1442.6
10/01	1442.6
11/02	1442.6
12/01	freeze-up .
Pool Bottom	1436.52
Full Pool Elevation	1442.12

IV. Ecological Effects of the Past Years Levels on Owens Bay

Pool levels reached capacity levels from heavy rains throughout the summer. The number of waterfowl pairs in 1993 was 94, down from 117 in 1992.

The pool level rose considerably higher than in 1992. This allowed residual vegetation from 1992 to become flooded and provided an increased nutrient base for the marsh and it's inhabitants.

V. 1994 Water Management Objectives

Water management activities for 1994 are to contain as much runoff as possible in Owens Bay. The artesian well will continue to run at full flow in order to offset as much annual evaporation as possible.

WATER UNIT: Broken Arrow Waterfowl Production Area

I. Introduction

The Broken Arrow WPA is a 2650 acre tract in Douglas and Charles Mix Counties, SD. Two drainage systems existed on the property when purchased. The Mud Lake Drain has an upstream watershed of 25,600 acres, while the second system, the Joubert Drain, has a 12,320 acre watershed. Five ditch plugs or low head dams, with concrete stop-log control structures, were installed in 1979 along the drainage ditches, two on the Mud Lake ditch and the remaining three on the Joubert drain. Dam #6 was constructed below dam #2 on the Mud Lake drain in 1984. Dam #7 on the Joubert Drain was constructed during the fall of 1986 in cooperation with Ducks Unlimited who funded the project design and construction. A water rights permit for the storage of 131.2 acre feet of water was granted by the South Dakota Department of Water and Natural Resources. The impoundment at capacity covers 56.4 surface acres. The development increased the quantity of pair habitat by creating 5.9 miles of shoreline. The maximum depth is 6.5 feet. Design specifications for the seven dams are as follows.

Embankment Volume YD ³	High Water Contour	Surface Acres	Acre-feet Impounded
Dam #1 - 76	Unk	6.2	5.7
Dam #2 - 755	Unk	27.9	82.6
Dam #3 - 2761	Unk	43.6	163.0
Dam #4 - 586	Unk	34.7	88.3
Dam #5 - 137	Unk	6.3	5.2
Dam #6 - 900	Unk	30.0	Not determined
Dam #7 - 5470	1526.0	56.4	131.2
TOTAL		205.1	476.0

The capability to manipulate water levels is very limited on the Broken Arrow WPA. Impoundments can be drawn down as objectives dictate. However, to reflood depends on spring runoff and no capability to flood when desired is possible.

II. Objectives

The storage of annual runoff in impoundments is to be used primarily as waterfowl production habitat. The habitat provided also benefits marsh and water birds, shorebirds, gulls, terns, and raptorial birds. Secondary benefits are provided to resident wildlife and livestock used for management purposes. Water excess to storage needs is allowed to drain through the system.

III. 1993 Water Conditions

The winter of 1992-93 was relatively mild with moderate snowpack in the broken arrow drainage. Total precipitation is not monitored on site, however it was similar to that of Lake Andes NWR which was above normal. Heavy rains resulted in all impoundments filling to capacity and a large amount of water was passed through the system.

IV. Ecological Effects of the Past Years Water Levels on the Broken Arrow WPA

All impoundments have experienced excellent growth in the pool bottoms by annual weeds and hydric plant species. The vegetated pool bottoms now support greater numbers of ring-necked pheasants and white-tail deer. Numerous non-game birds have been attracted to the food source provided by seeds from the annual weeds.

V. 1993 Water Management Objectives

Water management objectives for 1993 are to contain as much spring runoff as possible in all pools.

Five water control structures have been retrofitted with new screw gates allowing more efficient water management. They replaced the non-functional stoplog-liftgate structures. This project is dependent on 1994 precipitation amounts.

WATER UNIT: Karl E. Mundt National Wildlife Refuge

The Karl E. Mundt NWR borders the Missouri River in Gregory County. The refuge was established in 1974 to protect habitat important to wintering bald eagles. The only water on the unit itself is four small (less than 1 acre) stock ponds that are used in conjunction with the grazing program. There is also a free-flowing artesian well that provides water for a small 1/2 acre pond.

There presently is no active management of water on the Karl E. Mundt Refuge.

**WATER UNIT: Sherman Waterfowl Production Area
SD Water Permit No. 5251-3**

This water permit is for sufficient runoff water annually to fill the Sherman WPA to elevation 1591.7 feet msl. The Sherman WPA is located in a portion of the W $\frac{1}{2}$ Section 3; E $\frac{1}{2}$ NE $\frac{1}{4}$ Section 9; NW $\frac{1}{4}$ NW $\frac{1}{4}$ Section 10; all in T. 98 N., R. 66 W. The permit establishes first priority to 271 feet of an undivided interest in a total of 323 acre feet of water stored in a natural basin on both the Sherman WPA and private land at elevation 1591.7 feet msl. The water appropriated shall be used for the purpose of providing fish and wildlife habitat.

This basin was filled during heavy rains of 1993. The private individual who holds a SD water permit to use water from his portion of the basin did not pump any water for irrigation.

**WATER UNIT: Varilek Waterfowl Production Area
SD Water Permit No. 5250-3**

This water permit is for sufficient runoff water annually to fill the Varilek WPA to elevation 1614.0 feet msl. The Varilek WPA is located in the E $\frac{1}{2}$ Section 11, T. 98 N., R. 66 W., Charles Mix County, SD. The permit establishes first priority to 139 acre feet of an undivided interest in a total of 190 acre feet of water stored in a natural basin both on the Varilek WPA and private land at elevation 1614 feet msl. The water appropriated is used for the purpose of providing fish and wildlife habitat.

This basin filled in 1992. The private individual who owns a portion of the basin did not exercise his right to water.